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THE POSITION OF LEAD IN A CHALLENGING WORLD OF MODERN TECHNOLOGY (*)

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The story of lead has been remarkable in several respects. The consumption of lead during the whole of the 19th century was of the same order as that during the 20-year period between the great wars. Subsequently, the growth rate was much faster and in the last ten years the world consumption of lead was more than that during the entire 20-year period between the wars. The growth in consumption of lead in the past decade has shown a steady upward trend, due not only to the increased use of lead in the established applications but also to the new applications of this metal.

Lead-acid batteries

Batteries comprise the major outlet for lead and without much competition in this field, consumption of lead through this application is bound to rise with the increase in the number of vehicles manufactured. Batteries in use today are of three types:

i) SLI batteries for starting, lighting and ignition;

ii) traction batteries for industrial trucks and commercial road vehicles

iii) stationary batteries to provide emergency or auxiliary power.

In addition, there are other minor uses such as for portable appliances, television sets, etc. A steady growth is expected in all of these applications. In the last few years, there has also been a revival of interest in battery-powered passenger cars.

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Cable sheathing

Lead is the most preferred sheathing material for power cables in the medium voltage range. For voltages up to 1 KVA, there has been extensive substitution by plastics and in the higher ranges there has been some substitution by aluminium. Lead is still preferred where utmost reliability is required. According to present indications, no large-scale substitution of lead is expected in the near future. Furthermore, when thinner and stronger lead sheathing is developed, it may counteract the trend for substitution. Ultimately, a stage might come where a combination of materials like lead and plastics will be used for sheathing.

Sheet and pipes

About 300,000 tons of lead are being used for the manufacture of sheet and pipes for the building and chemical industry. Despite increased usage over the last decade, lead is facing stiff competition from other metals, notably from plastics. Lead laminates may find increasing use in the chemical industry if the tests to assess the effectiveness of the adhesion bonding techniques (to replace older methods of lead burning) for lining steel acid tanks etc. prove successful.

Pigments and alloys

While white lead has lost a significant portion of its market to titanium dioxide, red lead is holding its own as a heavy duty structural primer. The main competitors to lead pigments in primers for iron and steel are iron oxide, zinc dust and zinc chromate. Paints based on them require more thorough surface preparation though they may have some compensating advantages.

Lead alloys are extensively used in solders, printing metals and bearings. Different types of solders are used in the automobile industry to connect the contours of pressings and for radiator manufacture. The use of solder in making cans from tinplate is nowadays confined to the side seams, the end seams being sealed with "lining compounds". There is a trend towards reducing the amount of solder per can and the tin content of the solder.

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No significant changes in lead consumption in the form of solders are expected in the electrical and electronic industries. The introduction of printed circuits has not brought about a reduction in solder consumption but the current trend towards microminiaturisation may reduce the consumption of solder by the electronic industry some time in the future.

Lead sheets, collapsible tubes, etc.

Lead sheets, collapsible tubes, etc. are minor outlets for lead. The former is expected to grow steadily while the latter has regained some of the market it had lost to aluminium in respect of fluoride toothpastes where aluminium cannot be used.

Organolead compounds

In recent years under the active research programme of International Lead Zinc Research Organization (ILZRC) several new organolead compounds have been synthesised on a semi-technical scale and are being assessed industrially. All these will develop new markets in such diverse applications as antifoul-ing paints, wood preservatives, lubricant additives, anti-bacterial agents, molluscides for the control of bilharzia, rodent repellants, polyurethane foam catalysts, rot-resistant textiles, etc.

Noise and vibration control

Lead is finding increasing use in sound and vibration control due to its ideal combination of properties which make it a suitable barrier to airborne noise. For the same degree of sound attenuation a partition of lead will be lighter than that of other materials.

With the increased number of high speed and heavy vehicles, underground railways, airconditioning and other machinery, it is necessary to employ antivibration or isolation materials more extensively. Though lead by itself can be used for antivibration pads, a combination of lead and asbestos has not only vastly superior antivibration properties (than either material alone) but also has a number of other advantages like easy workability, corrosion and chemical resistance, imperviousness to water and very high load bearing capacity.

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Lead in ceramics

It has been possible to develop strongly adherent enamel coatings capable of withstanding repeated blows and resistant to chipping and cracking. Both functional and decorative effects can be achieved such as in the enamel coating of aluminium. Porcelain enamelled aluminium laminated on hardboard and masonite can be sawed, sheared or drilled with simple tools and hence finds immense use in and around the home.

Lead in thermo-electricity and piezo-electricity

Lead telluride is the most efficient material for power generation in the range of 500-1200°F. Its application can be as an auxiliary power from waste heat sources or as independent power packages for areas remote from power lines. Lead telluride is being increasingly used in thermo couples. A mixture of lead zirconate and lead titanate called PZT is an excellent piezo-electric material. It is used in ultrasonic cleaning and processing equipment and in "spark pumps" which form part of the starter mechanism of lawn mowers and other machines.

D.M. Process

Though lead is the ideal material for acoustical and roofing applications, it is still considered expensive, and its usage for these applications will depend on how much the cost of lead sheet is brought down. Significant achievements have been made in this direction by the invention of the machine for the continuous casting of lead sheet.

Dispersion strengthened lead

Research and development work on lead power metallurgy promises to yield several new products which will be considerably superior to the lead and lead products available at present. Rolled and extruded products of lead obtained from powders can be considerably strengthened by the introduction of a tin layer of oxide on their surface. This material has great potential application in the manufacture of battery grids, roofings and cable sheathing.

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